THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A lead composition for use in the production of battery components, the lead composition comprising

- lead
- 20-100 ppm silver
- 250-1000 ppm bismuth, and
- 250-1000 ppm zinc.

2. The lead composition of claim 1, wherein the lead is in metal or oxide form, or in a mixture of forms.

3. The lead composition of claim 2, wherein the lead is in metal form.

4. The lead composition of claim 2, wherein the lead is predominantly in the form of lead oxide.

5. The lead composition of claim 1, wherein the silver, bismuth and zinc are each present in metal form, or as a compound with one or more other elements.

6. The lead composition of claim 1, wherein the level of bismuth in the lead composition is between 250-700 ppm.

7. The lead composition of claim 1, wherein the level of bismuth in the lead composition is between 250-500 ppm.

8. The lead composition of claim 1, wherein the level of zinc in the lead composition is between 250-700 ppm.

9. The lead composition of claim 1, wherein the level of zinc in the lead composition is between 250-500 ppm.

10. The lead composition of claim 1, wherein the level of silver is between 20-70ppm.

11. The lead composition of claim 1, wherein the level of silver is between 20-66 ppm.

12. The lead composition of claim 1, wherein the lead composition comprises cadmium at a level of up to 1000 ppm.

13. The lead composition of claim 1, wherein the lead composition comprises cadmium at a level of 0-500 ppm.

14. The lead composition of claim 12, wherein cadmium is present at a minimum level of 20 ppm.

15. The lead composition of claim 1, wherein the lead composition comprises tin at a level of 5-80 ppm.

16. The lead composition of claim 1, wherein the lead composition comprises not more than 10 ppm cobalt, 15 ppm chromium, 5 ppm manganese, 3 ppm selenium, 5 ppm tellurium, 250 ppm germanium, and 20 ppm thallium.

17. The lead composition of claim 1, wherein lead composition comprises not more than 10 ppm nickel, 10 ppm antimony, 20 ppm iron, 20 ppm copper and 20 ppm arsenic.

18. The lead composition of claim 1, wherein the lead composition comprises not more than 2 ppm cobalt, 4 ppm chromium, 1.5 ppm manganese, 0.5 ppm selenium, 0.15 ppm tellurium, 10 ppm germanium, and 12 ppm thallium.

19. The lead composition of claim 18, wherein the lead composition comprises not more than 2 ppm nickel, 2 ppm antimony, 5 ppm iron, 5 ppm copper and 4 ppm arsenic.

20. A lead composition comprising:

- lead;

silver, bismuth, zinc and tin in the following amounts:

- Ag 20-100 ppm
- Bi 250-1000 ppm
- Zn 250-1000 ppm
- Sn 5-80 ppm

and not more than the given amounts of the following elements measured in ppm:

- Ni 10
- Sb 10
- Co 10
- Cr 15
- Fe 20
- Mn 5
- Cu 20
- Se 3
- Te 5
- As 20
- Ge 250
- Tl 20
- Cd 1000.

21. The lead composition of claim 20, wherein the lead composition contains not more than the following amounts for at least 8 of the 13 elements set out in the following list:

- Ni 2
- Sb 2
- Co 2
- Cr 4
- Fe 5
- Mn 1.5
- Cu 5
- Se 0.5
- Te 0.15
- As 4
- Ge 10
- Tl 12
- Cd 700.

22. A lead composition comprising:

- lead;

silver, bismuth, zinc and tin in the following amounts:

- Ag 20-70 ppm
- Bi 250-700 ppm
- Zn 250-700 ppm

- Sn 5-40 ppm

and not more than the given amounts of the following elements measured in ppm:

- Ni 2
- Sb 2
- Co 2
- Cr 4
- Fe 5
- Mn 1.5
- Cu 5
- Se 0.5
- Te 0.15
- As 4
- Ge 10
- Tl 12
- Cd 700

23. The lead composition of claim 1, wherein the lead composition is in the form of a lead metal, a lead oxide powder, a lead-containing paste or a cured lead coating.

24. A battery plate comprising a coating of a lead composition, the lead composition comprising:

- lead
- 20-100 ppm silver
- 250-1000 ppm bismuth, and
- 250-1000 ppm zinc.

25. A battery plate comprising a coating formed from a lead composition comprising:

- lead;

silver, bismuth, zinc and tin in the following amounts:

- Ag 20-100 ppm
- Bi 250-1000 ppm
- Zn 250-1000 ppm
- Sn 5-80 ppm

and not more than the given amounts of the following elements measured in ppm:

- Ni 10

- Sb 10
- Co 10
- Cr 15
- Fe 20
- Mn 5
- Cu 20
- Se 3
- Te 5
- As 20
- Ge 250
- Tl 20
- Cd 1000

26. A battery plate comprising a coating formed from a lead composition comprising:

- lead;

silver, bismuth, zinc and tin in the following amounts:

- Ag 20-70 ppm
- Bi 250-700 ppm
- Zn 250-700 ppm
- Sn 5-40 ppm

and not more than the given amounts of the following elements measured in ppm:

- Ni 2
- Sb 2
- Co 2
- Cr 4
- Fe 5
- Mn 1.5
- Cu 5
- Se 0.5
- Te 0.15
- As 4
- Ge 10
- Tl 12
- Cd 700

27. A battery comprising at least one battery plate with a coating of a lead

lead composition comprising:

- lead
- 20-100 ppm silver
- 250-1000 ppm bismuth, and
- 250-1000 ppm zinc.

28. A battery comprising a battery case, electrolyte and at least two battery plates, wherein said battery plates are coated with a lead composition comprising

- lead;

silver, bismuth, zinc and tin in the following amounts:

- Ag 20-100 ppm
- Bi 250-1000 ppm
- Zn 250-1000 ppm
- Sn 5-80 ppm

and not more than the given amounts of the following elements measured in ppm:

- Ni 10
- Sb 10
- Co 10
- Cr 15
- Fe 20
- Mn 5
- Cu 20
- Se 3
- Te 5
- As 20
- Ge 250
- Tl 20
- Cd 1000

29. A battery comprising a battery case, electrolyte and at least two battery plates, wherein said battery plates are coated with a lead composition comprising

- lead;

silver, bismuth, zinc and tin in the following amounts:

- Ag 20-70 ppm
- Bi 250-700 ppm
- Zn 250-700 ppm
- Sn 5-40 ppm

and not more than the given amounts of the following elements measured in ppm:

- Ni 2
- Sb 2
- Co 2
- Cr 4
- Fe 5
- Mn 1.5
- Cu 5
- Se 0.5
- Te 0.15
- As 4
- Ge 10
- Tl 12
- Cd 700

30. A lead composition for use in the production of positive battery plates comprising:

- lead
- 100-1000 ppm antimony
- 100-1000 ppm iron.

31. The lead composition of claim 30, wherein the lead composition comprises less than 700 ppm zinc.

32. The lead composition of claim 30, wherein the lead composition comprises between 250-700 ppm bismuth and 250-700 ppm zinc.

33. A lead composition for use in the production of negative battery plates comprising:

- lead
- 250-1000 ppm bismuth
- 250-1000 ppm zinc and
- 20-100 ppm silver,

and not more than 20 ppm antimony and not more than 30 ppm iron.

34. The lead composition of claim 33, wherein the level of bismuth is 250-

700ppm, and the level of silver is 20-70ppm.

35. The lead composition of claim 33, wherein the level of antimony and iron in the lead composition is not more than 2 ppm antimony and 5 ppm iron.

36. A lead composition for use in the production of pastes for positive battery plates comprising:

- lead;
- 100-1000 ppm antimony
- 100-1000 ppm iron;

and not more than the given amounts of the following elements, measured in ppm:

- Bi 1000
- Zn 1000
- Cd 1000
- Sn 80
- Ni 10
- Co 10
- Cr 15
- Mn 5
- Cu 20
- Ag 100
- Se 3
- Te 5
- As 20
- Ge 250
- Tl 20.

37. The lead composition of claim 36, wherein the lead composition comprises not more than the following amounts for at least 10 elements set out in the following list:

- Bi 700
- Zn 700
- Cd 500
- Sn 50
- Ni 2
- Co 2
- Cr 4

- Mn 1.5
- Cu 5
- Ag 66
- Se 0.5
- Te 0.15
- As 4
- Ge 10
- Tl 12

38. A lead composition for use in the production of pastes for positive battery plates comprising:

- lead
- 100-1000 ppm antimony
- 100-1000 ppm iron

and not more than the given amounts of the following elements, measured in ppm:

- Bi 700
- Zn 700
- Cd 500
- Sn 50
- Ni 2
- Co 2
- Cr 4
- Mn 1.5
- Cu 5
- Ag 66
- Se 0.5
- Te 0.15
- As 4
- Ge 10
- Tl 12.

39. A lead composition for use in the production of pastes for negative battery plates comprising:

- lead
- 250-1000 ppm Bi
- 250-1000 ppm Zn

- 20-100 ppm Ag

and not more than the given amounts of the following elements measure in ppm:

- Sb 10
- Fe 20
- Sn 80
- Cd 1000
- Ni 10
- Co 10
- Cr 15
- Mn 5
- Cu 20
- Se 3
- Te 5
- As 20
- Ge 250
- Tl 20

40. The lead composition of claim 39, wherein the lead composition contains not more than the following amounts for at least 9 of the 14 elements set out in the following list:

- Sb 2
- Fe 5
- Sn 50
- Cd 500
- Ni 2
- Co 2
- Cr 4
- Mn 1.5
- Cu 5
- Se 0.5
- Te 0.15
- As 4
- Ge 10
- Tl 12

41. A lead composition for use in the production of pastes for negative battery plates comprising

- lead
- 250-700 ppm Bi
- 250-1000 ppm Zn
- 40-66 ppm Ag

and not more than the given amounts of the following elements measure in ppm:

- Sb 2
- Fe 5
- Sn 50
- Cd 500
- Ni 2
- Co 2
- Cr 4
- Mn 1.5
- Cu 5
- Se 0.5
- Te 0.15
- As 4
- Ge 10
- Tl 12

42. A positive battery plate comprising a coating of a lead composition comprising:

- lead
- 100-1000 ppm antimony
- 100-1000 ppm iron

43. A positive battery plate comprising a coating of a lead composition comprising:

- lead
- 100-1000 ppm antimony
- 100-1000 ppm iron

and not more than the given amounts of the following elements, measured in ppm:

- Bi 1000
- Zn 1000
- Cd 1000
- Sn 80
- Ni 10

- Co 10
- Cr 15
- Mn 5
- Cu 20
- Ag 100
- Se 3
- Te 5
- As 20
- Ge 250
- Tl 20.

44. A positive battery plate comprising a coating of a lead composition comprising:

- lead
- 100-1000 ppm antimony
- 100-1000 ppm iron

and not more than the given amounts of the following elements, measured in ppm:

- Bi 700
- Zn 700
- Cd 500
- Sn 50
- Ni 2
- Co 2
- Cr 4
- Mn 1.5
- Cu 5
- Ag 66
- Se 0.5
- Te 0.15
- As 4
- Ge 10
- Tl 12.

45. A negative battery plate comprising a coating of a lead composition comprising:

- lead
- 250-1000 ppm Bi

- 250-1000 ppm Zn
- 20-100 ppm Ag

and not more than 20 ppm antimony and not more than 30 ppm iron.

46. A negative battery plate comprising a coating of a lead composition comprising:

- lead
- 250-1000 ppm Bi
- 250-1000 ppm Zn
- 20-100 ppm Ag

and not more than the given amounts of the following elements measure in ppm:

- Sb 10
- Fe 20
- Sn 80
- Cd 1000
- Ni 10
- Co 10
- Cr 15
- Mn 5
- Cu 20
- Se 3
- Te 5
- As 20
- Ge 250
- Tl 20

47. A negative battery plate comprising a coating of a lead composition comprising:

- lead
- 250-700 ppm Bi
- 250-1000 ppm Zn
- 40-66 ppm Ag

and not more than the given amounts of the following elements measure in ppm:

- Sb 2
- Fe 5
- Sn 50
- Cd 500

- Ni 2
- Co 2
- Cr 4
- Mn 1.5
- Cu 5
- Se 0.5
- Te 0.15
- As 4
- Ge 10
- Tl 12

48. A battery comprising at least one positive plate with a coating comprising:

- lead
- 100-1000 ppm antimony
- 100-1000 ppm iron

and at least one negative plate with a coating comprising:

- lead
- 250-1000 ppm bismuth
- 250-1000 ppm zinc
- 20-100 ppm silver

and not more than 20 ppm antimony and not more than 30 ppm iron.

49. A battery comprising at least one positive plate with a coating comprising:

- lead
- 100-1000 ppm antimony
- 100-1000 ppm iron;

and not more than the given amounts of the following elements, measured in ppm:

- Bi 1000
- Zn 1000
- Cd 1000
- Sn 80
- Ni 10
- Co 10
- Cr 15
- Mn 5

- Cu 20
- Ag 100
- Se 3
- Te 5
- As 20
- Ge 250
- Tl 20.

and at least one negative plate with a coating comprising:

- lead;
- 250-1000 ppm Bi
- 250-1000 ppm Zn
- 20-100 ppm Ag

and not more than the given amounts of the following elements measure in ppm:

- Sb 10
- Fe 20
- Sn 80
- Cd 1000
- Ni 10
- Co 10
- Cr 15
- Mn 5
- Cu 20
- Se 3
- Te 5
- As 20
- Ge 250
- Tl 20

50. A method for monitoring the level of undesirable elements in a lead composition, comprising the steps of:

(e) selecting maximum acceptable levels for the elements cobalt, chromium, manganese, selenium, tellurium, germanium and thallium in a lead composition;

(f) testing the level of said elements in a lead composition;

(g) evaluating the results of the test to determine whether the levels of the elements are within the selected maximum acceptable levels; and

(h) optionally modifying the lead composition to bring the level of any of the

elements that are outside the maximum acceptable levels within the maximum acceptable levels.

51. The method of claim 50, wherein step (b) comprises testing the level of said elements using inductively coupled plasma atomic emission spectroscopy.

52. The method of claim 50 further comprising the steps of

- selecting the required levels or maximum acceptable levels of the elements tin, bismuth, zinc, cadmium, nickel, antimony, iron, copper, silver and arsenic in a lead composition;
- testing the level of these elements;
- evaluating the results of the test to determine whether the levels of the elements are within the required levels or maximum acceptable levels; and
- optionally modifying the lead composition to bring the level of any of the elements that are outside the required levels or maximum acceptable levels within these levels.

Dated this 28th day of August 2003

COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANISATION and INTERNATIONAL LEAD ZINC RESEARCH ORGANIZATION, INC.
By their Patent Attorneys
GRIFFITH HACK
Fellows Institute of Patent and
Trade Mark Attorneys of Australia